

Application No. 09/934178
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Amendment
Attorney Docket No. S63.2N-5605-US05

Remarks

This Amendment is in response to the Office Action dated September 14, 2004. In the Office Action, claim 9 was objected to and claims 9-15 were rejected as anticipated. New claim 16 has been added. No new matter has been added with the amendment.

Claim Objections

Claim 9 is objected to because the phrase "the stent having" on line 11 of claim 9 is said to be confusing. The language in question in claim 9 has been copied from claim 1 of US 6106548 which is presumed to be valid. Applicant considers the language to be clear.

Applicant, nevertheless, has added new claim 16 which corresponds to claim 9 with the wording modified in light of the suggestion in the Office Action.

Claim Rejections

Claims 9-15 are rejected under 35 USC 102(e) as being anticipated by Moriuchi (US 6013854).

Claim 9 includes the recitation that "each peak portion being connected to one valley portion by a straight strut and connected to another valley portion by another straight strut, each valley portion being connected to one peak portion by a straight strut and connected to another peak portion by another straight strut, all of the straight struts in an annular element being of the same length, the peak portions being of the same length as the valley portions".

To the extent that Moriuchi were to be considered to have "annular elements", the struts within an "annular element" of Moriuchi are not all of the same length. Every other strut of Moriuchi is shorter.

At least for this reason, claims 9-15 are not anticipated by Moriuchi.

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List of applications claiming priority from the same parent application

In response to the Examiner's request for a list of copending applications and claims. Applicant notes that in the response dated May 19, 2003, a number of applications were identified. Applicant wishes to supplement that list with the additional applications listed in the table below. Copies of the pending claims from these additional applications are submitted herewith.

US Application No.	Attorney Docket No.
10/705,273	S63.2-6769-US03
10/728,513	S63.2-6769-US04
10/800,572	S63.2-6769-US05
10/817,508	S63.2-6769-US06
10/918,971	S63.2-6769-US07

Conclusion

Claims 9-16 are believed to be in condition for allowance. Withdrawal of the objection and rejection is requested.

Respectfully submitted,

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Date: December 14, 2004

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47. (New) A stent in the form of a thin-walled, cylindrical tube with a longitudinal axis, the stent comprising:

- a multiplicity of interior circumferential sets of strut members and one end circumferential set of strut members at each of the two longitudinal ends of the stent;
- each interior circumferential set of strut members including at least one connected strut member consisting of a long diagonal section having a longitudinal length fixedly attached to a connected curved section, each connected curved section of an adjacent circumferential set of a longitudinal connecting link to one connected curved section of an adjacent circumferential set of strut members; each interior set of strut members also including at least one unconnected strut member consisting of a short diagonal section having a longitudinal length fixedly joined to an unconnected curved section; and
- the stent being further characterized by having the length of each diagonal section being longer than the length of each short diagonal section and for each interior circumferential set of strut members, the number of connected curved sections being equal to the number of unconnected curved sections.

48. (New) A stent in the form of a thin-walled, cylindrical tube with a longitudinal axis, the stent comprising:

- a multiplicity of interior circumferential sets of strut members and one end circumferential set of strut members at each of the two longitudinal ends of the stent;
- each interior circumferential set of strut members including at least one connected strut member consisting of a long diagonal section having a longitudinal length fixedly attached to a connected curved section, each connected curved section being joined by means of a longitudinal connecting link to one connected curved section of an adjacent circumferential set of strut members and all connecting links that connect adjacent circumferential sets of strut members are connected at a connected curved section; each interior set of strut members also including at least one unconnected strut member consisting of a short diagonal section having a longitudinal length fixedly joined to an unconnected curved section; and
- the stent being further characterized by having the length of each long diagonal section being longer than the length of each short diagonal section, so that the unconnected strut members have a decreased tendency for flaring outward as the stent is advanced through a curved

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Claims 1-37. (Cancelled)

38. (New) A stent in the form of a thin-walled, cylindrical tube with a longitudinal axis, the stent comprising:

- a multiplicity of interior circumferential sets of strut members and one end circumferential set of strut members at each of the two longitudinal ends of the stent;
- each interior circumferential set of strut members including at least one connected strut member consisting of a long diagonal section having a longitudinal length fixedly attached to a connected curved section, each connected curved section being joined by means of a longitudinal connecting link to one connected curved section of an adjacent circumferential set of strut members and all connecting links that connect adjacent circumferential sets of strut members are connected at a connected curved section, each interior set of strut members also including at least one unconnected strut member consisting of a short diagonal section having a longitudinal length fixedly joined to an unconnected curved section.

39. (New) The stent of claim 38 wherein the longitudinal connecting link is straight.

40. (New) The stent of claim 38 wherein the longitudinal connecting link is an undulating, flexible, longitudinal connecting link.

41. (New) The stent of claim 40 wherein the place where each flexible longitudinal connecting link is joined to the interior set of strut members is near the connecting line where a connected curved section is joined to a diagonal section.

42. (New) The stent of claim 38 wherein there are three longitudinal connecting links that join each adjacent pair of circumferential sets of strut members.

43. (New) The stent of claim 38 wherein there are five longitudinal connecting links that join each adjacent pair of circumferential sets of strut members.

44. (New) The stent of claim 38 wherein the total longitudinal length in the longitudinal direction of each end circumferential set of strut members is shorter than the longitudinal length in the longitudinal direction of each interior circumferential set of strut members.

45. (New) The stent of claim 38 wherein the metal from which the stent is formed is stainless steel.

46. (New) The stent of claim 38 wherein the metal from which the stent is formed is tantalum.

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1-37. (Cancelled)

Claim 38. (New) A stent comprising a first serpentine column and a second serpentine column, each serpentine column having a plurality of peaks and troughs, the plurality of peaks comprising alternating first peaks and second peaks each first peak being comprised of a first strut pair and each second peak being comprised of a second strut pair, each first peak and each second peak extending in a longitudinal direction, each first peak extending further in a longitudinal direction than each second peak;

a connector connecting the first serpentine column and the second serpentine column, a pathway extending between a trough in the first serpentine column and a peak in the second serpentine column being defined by a first strut pair of the first serpentine column, the connector and a second strut pair of the second serpentine column.

Claim 39. (New) The stent of claim 38 wherein each strut of the pair of first struts has a length different from one another.

Claim 40. (New) The stent of claim 38 wherein each strut of the pair of second struts has a length different from one another.

Claim 41. (New) A stent comprising a first serpentine column and a second serpentine column, the first serpentine column and the second serpentine column each having a plurality of first struts and a plurality of second struts, each first strut being longer than each second strut, each first strut being connected at one end to a second strut and at another end to another first strut;

a connector connecting the first serpentine column and the second serpentine column, a first end of the connector extending from the first serpentine column where a first strut and a second strut are interconnected,

a second end of the connector extending from the second serpentine column where a first strut and a second strut are interconnected.

Claim 42. (New) A stent comprising a first serpentine column and a second serpentine column, the first serpentine column and the second serpentine column each having a plurality of first struts and a plurality of second struts, each first strut being longer than each second strut, each first strut being connected at one end to a second strut and at another end to another first strut;

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vessel.

49. (New) The stent of claim 48 wherein the longitudinal connecting link is straight.

50. (New) The stent of claim 48 wherein the longitudinal connecting link is an undulating, flexible, longitudinal connecting link.

51. (New) The stent of claim 50 wherein the place where each flexible longitudinal connecting link is joined to the interior set of strut members is near the connecting link where a connected curved section is joined to a diagonal section.

52. (New) The stent of claim 48 wherein there are three longitudinal connecting links that join each adjacent pair of circumferential sets of strut members.

53. (New) The stent of claim 48 wherein there are five longitudinal connecting links that join each adjacent pair of circumferential sets of strut members.

54. (New) The stent of claim 48 wherein the total longitudinal length in the longitudinal direction of each end circumferential set of strut members is shorter than the longitudinal length in the longitudinal direction of each interior circumferential set of strut members.

55. (New) The stent of claim 48 wherein the metal from which the stent is formed is stainless steel.

56. (New) The stent of claim 48 wherein the metal from which the stent is formed is tantalum.

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than each second trough,

adjacent serpentine columns being joined by a plurality of connectors, each connector extending from a trough on one serpentine column to a peak on an adjacent serpentine column,

Claim 48. (New) The stent of claim 47 wherein a portion of each connector extends in a circumferential direction.

Claim 49. (New) A stent in the unexpanded state comprising a plurality of interconnected serpentine columns, each serpentine column having a plurality of peaks and troughs, a first trough comprised of a first strut and a second strut, a first peak comprised of the second strut and a third strut, the second strut being longer than the first strut and longer than the third strut, each strut having a proximal curved section, a distal curved section and an intermediate section in between,

the first, second and third struts each having a proximal curved section, a distal curved section and an intermediate section,

portions of the proximal curved section of the first and second struts spaced further apart about the circumference of the stent than portions of the intermediate sections of the first and second struts,

portions of the distal curved sections of the second and third struts being spaced further apart about the circumference of the stent than portions of the intermediate section of the second and third struts.

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a connector connecting the first serpentine column and the second serpentine column, a first end of the connector extending from the first serpentine column between a first strut and a second strut, a second end of the connector extending from the second serpentine column between a first strut and a second strut.

Claim 43. (New) A stent comprising:
a first serpentine column, a second serpentine column, and a third serpentine column, each of the first, second and third serpentine columns having a plurality of peaks and troughs,

the plurality of peaks comprising first peaks and second peaks, each first peak being comprised of a pair of first struts and each second peak being comprised of a pair of second struts, each first peak and each second peak extending in a longitudinal direction, each first peak extending further in a longitudinal direction than each second peak, the struts of the first strut pair having lengths that are different from one another;

the first serpentine column and the second serpentine being connected by only first connections, the second serpentine column and the third serpentine column being connected by only second connections, all of the first connections being longitudinally and circumferentially offset from all of the second connections, at least a portion of each connection extending in a circumferential direction.

Claim 44. (New) The stent of claim 43 wherein in each serpentine column the first peaks are aligned along a common circumference.

Claim 45. (New) The stent of claim 43 wherein in each serpentine column the second peaks are aligned along a common circumference.

Claim 46. (New) The stent of claim 43 wherein in each serpentine column the first peaks are aligned along a single first circumference and the second peaks are aligned along a single second circumference different than the first circumference.

Claim 47. (New) A stent comprising a plurality of interconnected serpentine columns, each serpentine column having a plurality of peaks and troughs, the plurality of peaks comprising a plurality of first peaks and second peaks, the plurality of troughs comprising a plurality of first troughs and second troughs, each first peak extending further in a distal longitudinal direction than each second peak, each first trough extending further in a proximal longitudinal direction

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second open ends; the stent body having a plurality of adjacent circumferential support structures, the circumferential support structures being spaced-apart along the longitudinal axis; each support structure including longitudinal struts interconnected at apex portions, the longitudinal struts and apex portions defining an undulating pattern; and a plurality of circumferential connecting struts interconnecting at least some of the adjacent circumferential support structures, the circumferential connecting struts extending between the apex portions of adjacent circumferential support structures, at least some of the circumferential connecting struts having a width greater than a width of the longitudinal struts.

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1-37. (Cancelled)

38. (New) A stent comprising: a stent body expandable between an un-deployed orientation and a deployed orientation, the stent body having a longitudinal axis extending between first and second open ends; the stent body having a plurality of adjacent circumferential support

structures, the circumferential support structures being spaced-apart along the longitudinal axis; each support structure including longitudinal struts interconnected at apex portions, the longitudinal struts and apex portions defining an undulating pattern, at least some of the apex

portions of adjacent circumferential support structures being configured to longitudinally overlap one another when in the un-deployed configuration; a plurality of circumferential connecting struts interconnecting at least some of the adjacent circumferential support structures, the

circumferential connecting struts extending between the apex portions that overlap one another.

39. (New) The stent of claim 38 wherein in the deployed orientation, adjacent circumferential support structures are offset such that the apex portions on one side of a support structure are positioned intermediate the apex portions on a facing side of an adjacent support structure.

40. (New) The stent of claim 38 wherein at least some of the circumferential connecting struts have a width greater than a width of the longitudinal struts.

41. (New) The stent of claim 38 wherein the circumferential connecting struts joining first and second adjacent support structures extend in a first direction and the circumferential connecting struts joining second and third support structures extend in a second direction opposite the first direction.

42. (New) The stent of claim 1 wherein some of the longitudinal struts are longer than other longitudinal struts, and wherein the longer longitudinal struts provide the longitudinal overlap at the apex portions.

43. (New) The stent of claim 1 wherein the circumferential connecting struts connecting the apex portions are angled with respect to a circumferential direction.

44. (New) The stent of claim 38 wherein the undulating pattern defines a wavelength, and wherein the circumferential connecting members are at least one half the length of the wavelength.

45. (New) A stent comprising: a stent body expandable between an un-deployed orientation and a deployed orientation, the stent body having a longitudinal axis extending between first and

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lengthened and cells on the inside only shortened.

Claim 41. (New) A stent for widening a vessel in the human body comprising:

- a. a plurality of first circumferential bands containing a pattern of loops at a first frequency;
- b. a plurality of second circumferential bands containing a pattern of loops at a second frequency higher than said first frequency, alternating with said first circumferential bands and periodically coupled thereto to form cells,
- c. wherein loops in said bands are disposed and adapted to cooperate so that, when the expanded stent is in a curved lumen, cells on the outside of the curve open in length, but narrow circumferentially whereas cells on the inside of the curve shorten in length but widen circumferentially, and
- d. the second circumferential bands compensate for foreshortening of the first circumferential bands when the stent is expanded such that the widths of the first circumferential bands are smaller expanded than compressed, and the widths of the second circumferential bands are greater expanded than compressed.

Claim 42. (New) A stent according to claim 41 wherein compensation, which occurs when cells on the outside of the curve open in length, but narrow circumferentially and cells on the inside of the curve shorten in length but widen circumferentially, results in a more constant density of stent element area between the inside and the outside of the curve than if the cells on the outside only lengthened and cells on the inside only shortened.

Claim 43. (New) A stent according to claim 40 wherein compensation, which occurs when cells on the outside of the curve open in length, but narrow circumferentially and cells on the inside of the curve shorten in length but widen circumferentially, results in a more constant stent cell area between the inside and the outside of the curve than if the cells on the outside only lengthened and cells on the inside only shortened.

Claim 44. (New) A stent for holding open a blood vessel formed of a plurality of triangular cells, each triangular cell comprising:

- a. a first loop containing section, the first loop containing section arranged generally in the circumferential direction;
- b. a second loop containing section joined to the first loop containing section at a

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Claims 1-37. (Canceled)

Claim 38. (New) A stent for holding open a blood vessel comprising:

- a. a first loop containing section, the first loop containing section arranged generally in the circumferential direction, the loops in said first loop containing section occurring at a first frequency;
- b. a second loop containing section, the second loop containing section arranged generally in the circumferential direction, the loops in said second loop containing section also occurring at said first frequency; and
- c. a third loop containing section the third loop containing section, the loops in said third loop containing section occurring at a second frequency that is higher than said first frequency, disposed in the generally circumferential space between said first and second loop containing sections and alternately joined to said first and second loop containing sections,
- d. wherein the loops in said first, second and third loop containing sections are disposed and adapted to cooperate so that, when the expanded stent is in a curved lumen, cells on the outside of the curve open in length, but narrow circumferentially whereas cells on the inside of the curve shorten in length but widen circumferentially, and
- e. the third loop containing section compensates for foreshortening of the first and second loop containing sections when the stent is expanded such that the widths of the first and second loop containing sections are smaller expanded than compressed, and the width of the third loop containing section is greater expanded than compressed.

Claim 39. (New) A stent according to claim 38 wherein compensation, which occurs when cells on the outside of the curve open in length, but narrow circumferentially and cells on the inside of the curve shorten in length but widen circumferentially, results in a more constant density of stent element area between the inside and the outside of the curve than if the cells on the outside only lengthened and cells on the inside only shortened.

Claim 40. (New) A stent according to claim 38 wherein compensation, which occurs when cells on the outside of the curve open in length, but narrow circumferentially and cells on the inside of the curve shorten in length but widen circumferentially, results in a more constant stent cell area between the inside and the outside of the curve than if the cells on the outside only

- c. the second meander patterns compensate for foreshortening of the first meander patterns when the stent is expanded such that the widths of the first meander patterns are smaller expanded than compressed, and the width of the second meander patterns are greater expanded than compressed.

Claim 48. (New) A stent according to claim 47 wherein compensation, which occurs when cells on the outside of the curve open in length, but narrow circumferentially and cells on the inside of the curve shorten in length but widen circumferentially, results in a more constant density of stent element area between the inside and the outside of the curve than if the cells on the outside only lengthened and cells on the inside only shortened.

Claim 49. (New) A stent according to claim 47 wherein compensation, which occurs when cells on the outside of the curve open in length, but narrow circumferentially and cells on the inside of the curve shorten in length but widen circumferentially, results in a more constant stent cell area between the inside and the outside of the curve than if the cells on the outside only lengthened and cells on the inside only shortened.

Claim 50. (New) A multicellular stent for holding open a lumen, comprising:

- a. a plurality of even and odd vertical meander patterns, the odd vertical meander patterns being located between every two even vertical meander patterns and being out of phase with the even vertical meander patterns,
- b. a plurality of even and odd horizontal meander patterns, the odd horizontal meander patterns being located between every two even horizontal meander patterns,
- c. wherein the vertical meander patterns are intertwined with the horizontal meander patterns to form a plurality of triangular cells,
- d. wherein said horizontal meander patterns and said vertical meander patterns are disposed and adapted to cooperate so that after expansion of said stent, when said stent is disposed in a curved lumen, cells on the outside of the curve open in length, but narrow circumferentially whereas cells on the inside of the curve shorten in length but widen circumferentially, and
- e. said horizontal meander patterns and said vertical meander patterns form a high and a low frequency loop sections, wherein the high frequency loop section compensates for foreshortening of the low frequency loop section when the stent is expanded such that

first junction point; and

- c. a third loop containing section joined to the first loop containing section at a second junction point and joined to the second loop containing section at a third junction point,

d. wherein loops in said cells are disposed and adapted to cooperate so that, when the expanded stent is in a curved vessel, cells on the outside of the curve open in length, but narrow circumferentially whereas cells on the inside of the curve shorten in length but widen circumferentially, and

e. the third loop containing section compensates for foreshortening of the first and second loop containing sections when the stent is expanded such that the widths of the first and second loop containing sections are smaller expanded than compressed, and the width of the third loop containing section is greater expanded than compressed.

Claim 45. (New) A stent according to claim 44 wherein compensation, which occurs when cells on the outside of the curve open in length, but narrow circumferentially and cells on the inside of the curve shorten in length but widen circumferentially, results in a more constant density of stent element area between the inside and the outside of the curve than if the cells on the outside only lengthened and cells on the inside only shortened.

Claim 46. (New) A stent according to claim 44 wherein compensation, which occurs when cells on the outside of the curve open in length, but narrow circumferentially and cells on the inside of the curve shorten in length but widen circumferentially, results in a more constant stent cell area between the inside and the outside of the curve than if the cells on the outside only lengthened and cells on the inside only shortened.

Claim 47. (New) A stent for widening a vessel in the human body comprising:

- a. a plurality of first meander patterns;
- b. a plurality of second meander patterns intertwined with the first meander patterns to form triangular cells, said first meander patterns and said second meander patterns disposed and adapted to cooperate so that after expansion of said stent, when said stent is disposed in a curved vessel, cells on the outside of the curve open in length, but narrow circumferentially whereas cells on the inside of the curve shorten in length but widen circumferentially, and

- l) a tenth member having a first end and a second end, the first end of the fifth member communicating with the second end of the first member, the second end of the fifth member communicating with the second end of the sixth member, the first end of the sixth member communicating with the first end of the seventh member, the second end of the seventh member communicating with the second end of the eighth member, the first end of the eighth member communicating with the first end of the ninth member, the second end of the ninth member communicating with the second end of the tenth member, and the first end of the tenth member communicating with the second end of the fourth member;
- m) the fifth member and the sixth member with the curved portion at their ends forming a third loop;
- n) the seventh member and the eighth member with the curved portion at their ends forming a fourth loop; and
- o) the ninth member and the tenth member with the curved portion at their ends forming a fifth loop, wherein, when the expanded stent is in a curved lumen, cells on the outside of the curve at communication points of the first and fifth and fourth and tenth members, the cell opens up increasing the length of the cell and at each of the first through fifth loops, the adjoining members come closer to each other, to cause the cell to become narrower circumferentially and compensating for the increase in length, whereas cells on the outside of the curve at communication points of the first and fifth and fourth and tenth members, the cell closes down decreasing the length of the cell and at each of the first through fifth loops, the adjoining members move apart, to cause the cell to become wider circumferentially and compensate for the decrease in length, and
- the fifth through tenth members compensate for foreshortening of the first through fourth members when the stent is expanded such that width of the first through fourth members is smaller when expanded than compressed and width of the fifth through tenth members is larger when expanded than compressed.

Claim 54. (New) A stent according to claim 53 wherein the compensation which occurs on the outside of the curve and on the inside of the curve results in a more constant density of stent element area between the inside and the outside of the curve than if the cells on the outside only

width of the low frequency loop section is smaller when expanded than compressed and width of the higher frequency loop section is larger when expanded than compressed.

Claim 51. (New) A stent according to claim 50 wherein compensation, which occurs when cells on the outside of the curve open in length, but narrow circumferentially and cells on the inside of the curve shorten in length but widen circumferentially, results in a more constant density of stent element area between the inside and the outside of the curve than if the cells on the outside only lengthened and cells on the inside only shortened.

Claim 52. (New) A stent according to claim 50 wherein compensation, which occurs when cells on the outside of the curve open in length, but narrow circumferentially and cells on the inside of the curve shorten in length but widen circumferentially, results in a more constant stent cell area between the inside and the outside of the curve than if the cells on the outside only lengthened and cells on the inside only shortened.

Claim 53. (New) An expandable stent comprising a plurality of enclosed flexible spaces, each of the plurality of enclosed flexible spaces including:

- a) a first member having a first end and a second end;
- b) a second member having a first end and a second end;
- c) a third member having a first end and a second end;
- d) a fourth member having a first end and a second end; the first end of the first member communicating with the first end of the second member; the second end of the second member communicating with the second end of the third member; and the first end of the third member communicating with the first end of the fourth member;
- e) the first member and the second member with the curved portion at their ends forming a first loop;
- f) the third member and the fourth member with the curved portion at their ends forming a second loop;
- g) a fifth member having a first end and a second end;
- h) a sixth member having a first end and a second end;
- i) a seventh member having a first end and a second end;
- j) an eighth member having a first end and a second end;
- k) a ninth member having a first end and a second end; and

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Claims 1-37. (Canceled)

Claim 38 (New): A stent comprising

a first loop containing section, the first loop containing section arranged generally in the circumferential direction, the loops in said first loop containing section occurring at a first frequency;

a second loop containing section, the second loop containing section arranged generally in the circumferential direction, the loops in said second loop containing section also occurring at said first frequency; and

a third loop containing section, the loops in said third loop containing section occurring at a second frequency that is higher than said first frequency, the third loop containing section disposed in the generally circumferential space between said first and second loop containing sections and alternately joined to said first and second loop containing sections such that said first and second loop containing sections are joined together through the third loop containing section without connection directly between the first and second loop containing sections, wherein the first and second loop containing sections have three cycles for every five cycles of said third loop containing section, wherein the first loop containing section or the second loop containing section and the third loop containing section form at least one cell, the first loop containing section or the second loop containing section in the at least one cell further has at least one loop longitudinally shorter than another loop in the first loop containing section or the second loop containing section.

Claim 39 (New): A stent comprising

a first loop containing section, the first loop containing section arranged generally in the circumferential direction, the loops in said first loop containing section occurring at a first frequency;

a second loop containing section, the second loop containing section arranged generally in the circumferential direction, the loops in said second loop containing section also occurring at said first frequency and

a third loop containing section, the loops in said third loop containing section occurring at a second frequency that is higher than said first frequency, the third loop containing section disposed in the generally circumferential space between said first and second loop containing

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lengthened and cells on the inside only shortened.

Claim 55. (New) A stent according to claim 53 wherein the compensation which occurs on the outside of the curve and on the inside of the curve results in a more constant stent area between the inside and the outside of the curve than if the cells on the outside only lengthened and cells on the inside only shortened.

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sections and alternately joined to said first and second loop containing sections such that said first and second loop containing sections are joined together through the third loop containing section without connection directly between the first and second loop containing sections, wherein the first and second loop containing sections have fewer cycles than the third loop containing section, wherein the first loop containing section or the second loop containing section and the third loop containing section form at least one cell, the first loop containing section or the second loop containing section in the at least one cell further has at least one loop longitudinally shorter than another loop in the first loop containing section or the second loop containing section.